Chapter 9
Structured Query Language

Structured Query Language (SQL) is a language designed for managing data in RDBMS. It provides facilities to create a table, insert data into a table, retrieve information from a table, modify data in the table, delete the existing data from a table, modify the structure of a table, remove a table from a database, etc.

Components of SQL: Data Definition Language (DDL), Data Manipulation language (DML) and Data Control Language (DCL).

DDL commands are used to create, modify and remove the database objects such as tables, views and keys. Eg: CREATE TABLE, ALTER TABLE, DROP TABLE, CREATE VIEW, DROP VIEW.

DML permits users to insert data into tables, retrieve existing data, delete data from tables and modify the stored data. Eg: INSERT INTO, SELECT, UPDATE, DELETE FROM.

DCL includes commands that control a database, including administering privileges and committing data. Eg: GRANT, REVOKE.

SQL Data Types: INT or INTEGER, DEC or DECIMAL, CHAR or CHARACTER, VARCHAR, DATE, TIME.

DEC(5,2) or DECIMAL(5,2) denotes that the column with this specification can store any value having a maximum of five digits, out of which two are after the decimal point.

CHAR is a fixed length character data type. It is mainly used when the data in a column are of the same fixed length and small in size. VARCHAR represents variable length strings. The space allocated for the data depends only on the actual size of the string, not on the declared size of the column.

SQL Commands

Command and use	Syntax	Optional	Purpose
CREATE TABLE (To create a table)	CREATE TABLE *tbl_name* (*col_name* data type <constraint>, *col_name* data type <constraint>, ... *col_name* data type <constraint>);	Constraints – The rules enforced on data that are entered into the column of a table. 1. PRIMARY KEY 2. AUTO_INCREMENT 3. NOT NULL 4. UNIQUE 5. DEFAULT	1. To uniquely identify a row of a table. 2. To assign serial numbers automatically. 3. To avoid null value. 4. To avoid duplication. 5. To set a default value.
ALTER TABLE (To change the structure of a table)	ALTER TABLE *tbl_name* ADD / MODIFY *col_name* data type <constraint>; (To add a new column or modify an existing column in a table)	DROP *column*	Instead of ADD / MODIFY use DROP to remove an existing column.
		RENAME TO *new_tbl_name*;	To change the name of a table.

DROP TABLE	DROP TABLE <table_name>;		To remove a table from a database.
INSERT INTO (To insert a record)	INSERT INTO *tbl_name* VALUES (*val1, val2, val3, ...*);	Use of Null as a value	If a row does not contain values for all the columns, the keyword Null should be given for the respective column.
SELECT (To retrieve information from table)	SELECT *col_name1, col_name2, …* FROM *tbl_name*; (Instead of specifying all columns, the symbol * can be used)	DISTINCT *column*	To avoid duplicate values in the given column while selecting rows.
		WHERE *condition*; (Conditions are made using relational operators)	To select only those rows which satisfy the given condition.
		ORDER BY *column* (Keyword DESC may be used after column name to get the list in descending order)	To list the selected rows in ascending order of values in the specified column.
		GROUP BY *column* (Usually used when aggregate function are applied)	To group the rows having same value in the specified column. The SELECT command will be applied on the groups.
		HAVING *condition* (Used with GROUP BY clause)	To form groups based on condition.
UPDATE (To modify the values in columns)	UPDATE *tbl_name* SET *col_name = value*; (Value may be a constant or an expression)	WHERE *condition*;	To modify the columns of only those rows which satisfy the specified condition.
DELETE (To delete rows/records)	DELETE FROM *tbl_name*;	WHERE *condition*;	To delete only those rows which satisfy the specified condition.

Additional Commands

Command	Purpose
CREATE DATABASE *db_name*;	To create a new database.
USE *db_name*;	To open a database to perform operation on tables.
DESCRIBE *tbl_name*;	To display the structure of a table.
SHOW TABLES;	To list the tables in the current database.

Relational Operators for setting conditions

< <= > >= = <> (*Not equal to*)

Special Operators & Aggregate Functions

Operators are used to make conditions to attach with WHERE clause.

Functions used with SELECT command to get processed results from tuples.

Operator/ Function	Purpose	Example
LIKE	To identify pattern matching.	SELECT * FROM Student WHERE Name LIKE "%Kumar";
BETWEEN ... AND	To identify value that falls in a given range.	SELECT * FROM Employee WHERE Salary BETWEEN 10000 AND 20000;
IN	To identify value from a given list.	SELECT * FROM Bank WHERE Branch IN ("Trivandrum", "Ernakulam", "Kozhikode");
IS	To identify null values in a column.	SELECT * FROM Stock WHERE Tax IS NULL;
AND	To select rows when two or more conditions are TRUE.	SELECT * FROM Student WHERE Batch = "Science" AND Marks > 50;
OR	To select rows when any one of the conditions is TRUE.	SELECT * FROM Players WHERE Game = "Cricket" OR Game = "Hockey";
NOT	To select rows when the given condition is FALSE.	SELECT * FROM Stock WHERE Tax IS NOT NULL;
Aggregate Functions		
COUNT()	To count the non-null values of a column. Also used to get number of rows	SELECT COUNT(Fee) FROM Student; SELECT COUNT(*) FROM Student;
SUM()	To find the sum of values in a column.	SELECT SUM(Fee) FROM Student;
AVG()	To find the average of values in a column.	SELECT AVG(Salary) FROM Employee;
MAX()	To find the highest value in a column.	SELECT MAX(Marks) FROM Student;
MIN()	To find the lowest value in a column.	SELECT MIN(Marks) FROM Student;

Nested Query

When we use SELECT command with WHERE clause, the condition may be framed with another SELECT query.

For example, the following statement gives the details of students who got highest marks:

```
SELECT * FROM Student
WHERE Marks = (SELECT MAX(Marks) FROM Student);
```

The following statement gives the details of employees who get lowest salary:

```
SELECT * FROM Employee
WHERE Salary = (SELECT MIN(Salary) FROM Employee);
```

View: It is a virtual table that does not really exist in the database, but is derived from one or more tables. A view can be created with the DDL command CREATE VIEW.

```
CREATE VIEW <view_name>
AS SELECT <columns> FROM <table_name>
```

[WHERE *<condition>*];

To remove a view definition, use the command DROP VIEW *<view_name>*;

Questions from Previous Years' Question Papers (Computer Science)

1. Give the correct syntax of the queries in SQL for the following:
   (a) Renaming a table
   (b) Deleting rows from a table.
   (c) Changing definition of a column.
   (d) Removing columns from a table.
   (e) Adding a new column. (5) (March 2016)
2. What happens when we use DELETE FROM command without a WHERE clause? (1) (SAY 2016)
3. If a table named "mark" has fields regNo, subCode, and marks, write SQL statements for the following:
   (a) List the subject codes eliminating duplicates.
   (b) List the marks obtained by students with subject codes 3001 and 3002.
   (c) Arrange the table based on marks for each subject.
   (d) List all the students who have obtained marks above 90 for the subject codes 3001 and 3002.
   (e) List the contents of the table in the descending order of marks. (5) (SAY 2016)
4. Distinguish between DDL and DML and give examples for each type. (5) (March 2017)
5. Null values in tables are specified as "null". State whether true or false.(1) (March 2017)
6. Which command is used to delete the table?
   (a) delete from (b) drop table (c) delete table (d) drop view (1) (SAY 2017)
7. Differentiate between CHAR and VARCHAR data types in SQL. (3) (SAY 2017)
8. Name the most appropriate SQL data types required to store the following data:
   (a) Name of a student (maximum 70 characters)
   (b) Date of Birth of a student
   (c) Percent of marks obtained (correct to 2 decimal places) (3) (SAY 2017)

Questions from Previous Years' Question Papers (Computer Applications)

1. _____keyword is used in SELECT query to eliminate duplicate values in a column.
   (a) UNIQUE (b) DISTINCT (c) NOT NULL (d) PRIMARY (1) (March 2016)
2. Consider the following table named ACCOUNTS:

Acc. No.	Name	Branch	Amount
1001	Anil	Trivandrum	30000
1002	Sanjay	Ernakulam	130000
1003	Meera	Kottayam	275000
1004	Sneha	Kottayam	50000
1005	Rajan	Thrissur	75000

   (a) Write SQL statements to do the following:
      (i) Display all the details of accounts with amount greater than 50000 in Ernakulam branch.

(ii) Display Acc. No., Branch and Amount in the descending order of amount.

(iii) Display the number of accounts in each branch. (3) (March 2016)

(b) Write SQL statements to do the following:

(i) Add a new record into the table.

(ii) Update the amount of Sanjay to 100000.

(iii) Delete the details of Anil. (3) (March 2016)

3. How will you add a new column to an existing table using SQL statement? (2) (March 2016)

4. _____clause of SELECT query is used to apply condition to form group of records.
(a) order by (b) group by (c) having (d) where (1) (SAY 2016)

5. What is a view? How can we create a view using SQL statement? (2) (SAY 2016)

6. (a) Explain the SQL statements used to insert and delete data from a table. (3) (SAY 2016)

(b) Explain any two DDL commands. (3) (SAY 2016)

7. _____is an SQL data type which is used to represent variable length string. (1) (March 2017)

8. The structure of the table 'EMPLOYEE' is given below:

Empcode	Numeric
Empname	String
Basicpay	Numeric
DA	Numeric
Grosspay	Numeric

Write SQL statements for the following:

(a) Insert a record into the table.

(b) Update DA with 60% basic pay.

(c) Display the details of employees whose basic pay is greater than 20000.

(d) Rename the table EMPLOYEE to EMPDETAILS. (5) (March 2017)

9. _____command in SQL is used to display the structure of a table.
(a) LIST (b) STRUCT (c) DESCRIBE (d) SHOW (1) (SAY 2017)

10. Explain primary key constraint with an example. (2) (SAY 2017)

11. Write SQL for:

(a) Create a table student with the data [name char(20), rollno number(3), marks number(3)].

(b) List name and rollno of all students.

(c) List name and rollno of students having marks > 600. (3) (SAY 2017)

12. An employee table contains name, empno, basicpay, design.
Write SQL for

(a) Display name, empno and basicpay of all managers. (design = "manager")

(b) Display empno and salary of all employees.
(salary = basicpay + da) (da = basicapy * 1.15)

(c) Display name and empno of all the employees whose basicpay < 10000. (3) (SAY 2017)